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Market Returns to Education in Pakistan, Corrected for Endogeneity Bias

Sajjad Haider Bhatti*, Muhammad Aslamand Jean Bourdon*****

Abstract

This paper estimates the Mincer wage model for Pakistan's labor market, using a relatively recent dataset and new independent variables. We employ instrumental variables and two-stage least squares to address the problem of the endogeneity of education. Our results show that the returns to education are biased downward due to endogeneity, with significant wage gaps emerging among different regions, between genders and between urban and rural job markets. The study's choice of instruments has conceptual as well as empirical grounds. Our findings establish that the wage determination process is different for males and females across provincial labor markets.

Keywords: Endogeneity of education, human capital model, instrumental variables, Mincer regression, labor market, returns to schooling, Pakistan.

JEL classification: C26.

1. Introduction

The labor market remunerates workers based on their knowledge and the competencies they have acquired over their working life. Collectively, these skills comprise a worker's human capital. The interrelation between human capital and market earnings is captured by the human capital earnings function developed by Mincer (1958, 1974), Becker (1975) and Ben-Porath (1967). This model shows how formal education and on-the-job training (experience) are the key factors contributing to human capital. Mincer's (1974) model of human capital is commonly used to determine the impact of education and training on remuneration (see, for instance, Willis, 1986; Card, 1999). Even in its most basic form, the model

* Department of Statistics, Government College University, Faisalabad, Pakistan.
** Department of Statistics, Bahauddin Zakariya University, Multan, Pakistan.
*** IREDU- CNRS, Université de Bourgogne, Dijon, France.

remains a key approach to calculating earning differentials associated with urban versus rural status, unionized versus non-unionized status, gender, ethnicity, public versus private sector work, and religion (see Johnson & Chow, 1997; Kimmel, 1997; Lassibille, 1998; Korsun, 2010).

Despite the extensive application of the Mincer model, simple estimations using ordinary least squares (OLS) may be biased due to endogenous schooling variables and sample selectivity (Griliches, 1977, 1979; Angrist & Krueger, 1991). The endogeneity problem arises when the explanatory variables are correlated with the error terms: this problem is built into the Mincer earnings function because all individuals in a wage market can never be exactly the same with respect to different unobservable and observable characteristics (Bhatti et al., 2013). Innate ability, for instance, is treated as a determinant of wages, but it is also correlated with schooling. Since innate ability is not directly measureable, simple OLS estimations are likely to yield biased results (Griliches, 1977; Card, 2001), with adverse implications for policymaking.

This endogeneity bias is generally addressed by estimating the human capital earnings function using an approach that combines instrumental variables with two-stage least squares (IV-2SLS), developed by Theil (1953) and Basmann (1957). The technique relies on different instruments of exogenous variation, including birth cohorts, the education level of other household members, IQ test scores, changes in education system and household sibling composition (Ashenfelter et al., 1999; Butcher & Case, 1994).[1] The literature suggests that the schooling coefficient is higher when one accounts for possible endogeneity using IV-2SLS relative to simple OLS.

While many studies have estimated a human capital earnings function for Pakistan, most have not tackled econometric problems such as the potential endogeneity of the schooling variable.[2] The few studies that do so (using instrumental variables) include Abbas and Foreman-Peck (2008), Aslam et al. (2008) and Aslam (2009). This points to ample room for quantifying the economic returns to education in the Pakistani labor market, corrected for endogeneity bias using new instruments. The rest of the article is structured as follows. Section 2 describes the data, variables and method used, including the nature of the instrumental variables involved. Section 3 presents the results of the Mincer model, estimated using OLS and IV-2SLS.

[1] For further reading, see the references given in Bhatti et al. (2013).
[2] See, among others, Qureshi (2012); Aslam and Kingdon (2009); Farooq and Sulaiman (2009); Hyder and Reilly (2005).

The model is estimated separately for males and females and for the four provinces. Section 4 briefly discusses these results relative to the literature on Pakistan and Section 5 concludes the paper.

2. Methodology

We have used data from the Labor Force Survey conducted by the Pakistan Bureau of Statistics in 2008/09. After cleaning the data, we are left with 19,574 observations. We take the monthly wage of individuals as the response variable. The independent variables include different human capital and other social, economic and regional factors contributing to wage determination (Table 1).

Table 1: Variables used to estimate Mincer earnings function

Variable	Definition
Dependent variable	
Lnwage	Natural logarithm of the individual's monthly wage (main job)
Independent variables	
Education	Number of years of schooling completed
Experience	Potential experience measured in years (age – 6 – SCH1)
Experience2	Potential experience squared
Hours	Number of hours accounting for monthly salary (hours worked per month)
Gender	Gender (male = 1, female = 0)
Urban	Dummy variable indicating where the individual's work is located (urban = 1, rural = 0)
Professional	Dummy variable indicating whether the individual has a professional or general degree/diploma (professional = 1, general = 0)
Public	Dummy variable indicating whether the individual works in the public or private sector (public = 1, private = 0)
Tmp.contract	Dummy variable indicating that the individual has temporary employment (without contract) (reference category)
Fix.contract	Dummy variable indicating whether the individual has a fixed-term contract (yes = 1, otherwise 0)
Perm.contract	Dummy variable indicating whether the individual has a permanent contract (yes = 1, otherwise 0)
Punjab	Dummy variable indicating that the individual is from Punjab (reference category)
Sindh	Dummy variable indicating whether the individual is from Sindh (yes = 1, otherwise 0)
KP	Dummy variable indicating whether the individual is from KP (yes = 1, otherwise 0)
Balochistan	Dummy variable indicating whether the individual is from Balochistan (yes = 1, otherwise 0)

Identifying a relevant valid instrument is difficult (Bound et al., 1995). While many studies have used different instruments in IV-2SLS estimations of the earnings function, the issue of endogeneity bias persists (Angrist & Krueger, 1992). We estimate the Mincer earnings function for Pakistani wage market data, using two instrumental variables.

- Instrument 1 is the average numbers of years of schooling attained in the enumeration block where the individual's household is located. The rationale for using this instrument is to combine the effects of several commonly used exogenous factors, including distance to school, general trend toward education, and social environment.
- Instrument 2 follows a similar logic, but also accounts for other factors at the time the individual leaves formal schooling and joins the workforce. Following Bhatti et al. (2013), we define Instrument 2 as the average number of years of schooling attained by a given gender and age group in the year the individual joined the labor market. The data is taken from Barro and Lee (2010), who have estimated the average number of years of schooling for a large sample of countries for 1950–2010.[3]

3. Data Analysis and Results

Tables 2–5 give the results of the estimated human capital earnings function for the Pakistani labor market. The first column in each case presents the OLS results (uncorrected for potential endogeneity bias), while the remaining columns present the IV-2SLS estimation results using both instrumental variables. In the first-stage regressions, the substantially low p-values (given in parentheses) linked to the instrumental variables indicate that both can be considered relevant instruments. The validity of these instruments is assessed using the Sargan test, which indicates that they are valid for Balochistan, but only for females in the other three provinces.

The analysis employs separate Mincer wage models for males and females in all four provinces. Tables 2–5 give the OLS and IV-2SLS estimation results for males and females in Punjab, Sindh, Khyber Pakhtunkhwa (KP) and Balochistan, respectively. In all four cases, the Hausman (1978) exogeneity test statistic indicates significant bias due to the endogeneity of the schooling variable. A comparison of the OLS and IV-2SLS results for endogenous schooling reveals a downward bias associated with this endogeneity. The downward bias in returns to

[3] These measures of average schooling by gender and age group for different countries are available at www.barrolee.com.

schooling is higher for males in Sindh and KP, and for females in Punjab, but similar for both in Balochistan.

The higher coefficient in the IV-2SLS estimations is in line with international studies such as Butcher and Case (1994), Card (1999), Ashenfelter et al. (1999) and Chen and Hamori (2009) as well as Pakistan-based studies such as Abbas and Foreman-Peck (2008) and Aslam (2009). Bhatti et al. (2013) find similar differences in endogeneity-corrected and uncorrected returns to schooling, using similar instruments applied to data for France.

Table 2: OLS and IV-2SLS estimation results, Punjab

Variable	Males			Females		
	OLS	**First stage**	**Second stage**	**OLS**	**First stage**	**Second stage**
Intercept	8.0639	-5.2761	7.7622	8.3405	30.0627	7.6287
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Education	0.0507	–	0.0755	0.0504	–	0.085
	(<0.0001)		(<0.0001)	(<0.0001)		(<0.0001)
Experience	0.0308	0.0235	0.0366	0.0299	-0.7469	0.0381
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Experience^2	-0.0004	0.0002	-0.0004	-0.0005	0.0054	-0.0004
	(<0.0001)	(<0.0001)	(<0.0001)	(0.0046)	(<0.0001)	(0.0104)
Hours	0.0011	-0.0183	0.0018	-0.0015	-0.1073	0.0039
	(0.2055)	(0.0028)	(0.05023)	(0.6248)	(<0.0001)	(0.2630)
Urban	0.1115	-0.1426	0.1089	-0.0129	-0.0084	-0.0194
	(0.0016)	(0.5558)	(0.0025)	(0.9042)	(0.9898)	(0.8614)
Professional	0.5445	2.8599	0.4038	0.8179	2.7708	0.6765
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0009)	(<0.0001)
Public	-0.0912	-0.6382	-0.0638	-0.1849	-1.0436	-0.1368
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0024)
Fix.contract	0.0454	1.4152	-0.0103	-0.0065	1.3017	-0.0775
	(0.1341)	(<0.0001)	(0.7451)	(0.9375)	(0.0103)	(0.3786)
Perm.contract	0.2822	2.7877	0.1709	0.3006	2.5786	0.1553
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0497)
Instrument 1	–	0.6752	–	–	0.5424	–
		(<0.0001)			(<0.0001)	
Instrument 2	–	1.6564	–	–	-3.2193	–
		(<0.0001)			(<0.0001)	
Hausman exogeneity test	–	72.34		–	15.38	
		(<0.0001)			(<0.0001)	
Sargan–Hansen test	–	24.77		–	0.01	
		(0.0002)			(0.9208)	
R^2	0.4087	0.5836	0.384	0.4417	0.7104	0.4045
F/Wald statistic	290.9	530.6	257.1	39.9	111.1	37

Source: Authors' estimates.

Table 2 presents the OLS and IV-2SLS estimation results for males and females working in Punjab. The returns to schooling are 7.55 percent for males and 8.05 percent for females, implying that every additional year spent in school increases wages by 7.76 percent. The returns to labor market experience are slightly higher in the IV-2SLS estimation: each additional year of labor market experience increases monthly wages by 3.6 percent for males and 3.8 percent for females. The negative coefficient of work experience squared indicates that the returns to experience are concave, that is, the rate of increase tends to fall as labor market experience rises.

The coefficient of work location (urban or rural) is significant only for males. Urban male workers in Punjab earn nearly 10.89 percent more than their rural counterparts. Male workers with a professional degree earn 40 percent more than those with a general qualification. The corresponding wage premium for females is 67 percent. The wage loss associated with working in the public sector is about 6.3 percent for males and about 13 percent for females. Finally, the results show that males with permanent employment earn about 17.09 percent more than those on a fixed-term contract. The corresponding wage premium for females is 15.53 percent. The subsequent tables (Table 3–5) reveal similar results.

Table 3: OLS and IV-2SLS estimation results, Sindh

Variable	Males			Females		
	OLS	**First stage**	**Second stage**	**OLS**	**First stage**	**Second stage**
Intercept	7.8893	-4.9993	7.2441	8.0007	31.4907	7.2394
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Education	0.0636	–	0.1136	0.0624	–	0.0981
	(<0.0001)		(<0.0001)	(<0.0001)		(<0.0001)
Experience	0.0363	0.1119	0.0425	0.0099	-0.7253	0.0159
	(<0.0001)	(<0.0001)	(<0.0001)	(0.3424)	(0.0019)	(0.0148)
Experience^2	-0.0004	-0.0018	-0.0004	-0.0089	0.0058	-0.0086
	(<0.0001)	(<0.0001)	(<0.0001)	(0.9238)	(0.0019)	(0.9182)
Hours	0.003	-0.0363	0.0048	0.012	-0.1457	0.019
	(0.0031)	(<0.0001)	(<0.0001)	(0.0051)	(<0.0001)	(0.0002)
Urban	-0.0039	-0.4386	0.0253	-0.3076	-0.2443	-0.3351
	(0.9283)	(0.1440)	(0.5894)	(0.1774)	(0.8565)	(0.1556)
Professional	0.2709	2.372	0.0299	0.6767	2.6867	0.5365
	(<0.0001)	(0.0001)	(<0.0001)	(<0.0001)	(0.0005)	(0.0003)
Public	-0.1057	-0.6558	-0.0523	-0.1052	-1.0217	-0.0324
	(<0.0001)	(<0.0001)	(<0.0001)	(0.0610)	(0.0016)	(0.6061)
Fix.contract	0.0572	0.9634	-0.0344	-0.14	0.2583	-0.163
	(0.0828)	(0.0001)	(0.3433)	(0.3001)	(0.7461)	(0.2437)
Perm.contract	0.2782	2.333	0.0511	0.2883	1.5566	0.1757
	(<0.0001)	(<0.0001)	(0.07691)	(0.0011)	(0.0026)	(0.0747)
Instrument 1	–	0.6687	–	–	0.5857	–
		(<0.0001)			(<0.0001)	
Instrument 2	–	1.7457	–	–	-3.3918	–
		(<0.0001)			(<0.0001)	
Hausman exogeneity test	–	307.450		–	19.620	
		(<0.0001)			(<0.0001)	
Sargan–Hansen test	–	4.926		–	1.461	
		(0.0265)			(0.2268)	
R^2	0.5085	0.6068	0.4210	0.4809	0.6842	0.4453
F/Wald statistic	387.4	519.9	330.7	25.63	53.73	23.29

Source: Authors' estimates.

Table 4: OLS and IV-2SLS estimation results, KP

Variable	Males			Females		
	OLS	**First stage**	**Second stage**	**OLS**	**First stage**	**Second stage**
Intercept	7.8986 (<0.0001)	-4.603 (0.0348)	7.5054 (<0.0001)	7.5098 (<0.0001)	33.5428 (<0.0001)	7.2194 (<0.0001)
Education	0.0559 (<0.0001)	–	0.0804 (<0.0001)	0.0631 (<0.0001)	–	0.0756 (0.0014)
Experience	0.0389 (<0.0001)	0.1598 (0.0010)	0.0421 (<0.0001)	0.0245 (0.0564)	-0.6386 (0.0001)	0.0258 (0.0486)
Experience^2	-0.0004 (<0.0001)	-0.0027 (0.0001)	-0.0004 (<0.0001)	-0.0012 (0.887)	0.0028 (0.2571)	0.0001 (0.7846)
Hours	0.0002 (0.976)	-0.0734 (<0.0001)	0.0025 (0.1261)	0.012 (0.0329)	-0.1979 (<0.0001)	0.0151 (0.0406)
Urban	0.0718 (0.1797)	-0.3079 (0.4642)	0.0672 (0.2202)	-0.0155 (0.9175)	2.597 (0.0103)	-0.0471 (0.7662)
Professional	0.5952 (<0.0001)	2.5934 (<0.0001)	0.481 (<0.0001)	0.3895 (0.3004)	0.8641 (0.73911)	0.3569 (0.3496)
Public	-0.0351 (0.1518)	-1.1535 (<0.0001)	0.0064 (0.8127)	-0.3604 (0.0001)	-1.2231 (0.0411)	-0.3423 (0.0003)
Fix.contract	0.2128 (0.0003)	1.0571 (0.0206)	0.1703 (0.0049)	0.2256 (0.2325)	-0.5132 (0.6192)	0.226 (0.2339)
Perm.contract	0.1111 (0.0018)	2.12 (<0.0001)	0.0294 (0.4825)	0.3589 (0.0042)	-0.4048 (0.0063)	0.3502 (0.0057)
Instrument 1	–	0.6147 (<0.0001)	–	–	0.4174 (<0.0001)	–
Instrument 2	–	2.0966 (<0.0001)	–	–	-2.9922 (0.0003)	–
Hausman exogeneity test	–	16.446 (<0.0001)		–	18.446 (<0.0001)	
Sargan–Hansen test	–	6.964 (0.0083)		–	0.558 (0.4550)	
R^2	0.4308	0.5666	0.4044	0.4521	0.5967	0.4470
F/Wald statistic	113.3	175.9	88.45	13.57	21.75	10.81

Source: Authors' estimates.

Table 5: OLS and IV-2SLS estimation results, Balochistan

Variable	Males			Females		
	OLS	**First stage**	**Second stage**	**OLS**	**First stage**	**Second stage**
Intercept	8.5959 (<0.0001)	-8.7668 (<0.0001)	8.3309 (<0.0001)	8.1682 (<0.0001)	32.515 (0.0001)	7.8487 (<0.0001)
Education	0.0533 (<0.0001)	–	0.0702 (<0.0001)	0.0594 (<0.0001)	–	0.0752 (<0.0001)
Experience	0.028 (<0.0001)	0.2843 (<0.0001)	0.0292 (<0.0001)	0.0365 (0.0095)	-0.9402 (<0.0001)	0.0416 (0.0051)
Experience^2	-0.0003 (0.0019)	-0.0044 (<0.0001)	-0.0002 (0.0107)	-0.0005 (0.1438)	0.0063 (0.1139)	-0.0006 (0.1315)
Hours	-0.0041 (0.0321)	-0.0685 (<0.0001)	-0.0024 (0.2383)	-0.004 (0.4762)	-0.1585 (0.0064)	0.0002 (0.9743)
Urban	-0.0766 (0.1466)	0.5578 (0.1605)	-0.091 (0.0897)	-0.1714 (0.6141)	0.4092 (0.9061)	-0.1728 (0.6186)
Professional	0.2428 (0.0022)	2.8487 (<0.0001)	0.1564 (0.0693)	0.1079 (0.5476)	3.0128 (0.0931)	0.0402 (0.831)
Public	-0.1226 (<0.0001)	-1.3242 (<0.0001)	-0.086 (0.0026)	-0.0281 (0.8468)	2.0174 (0.1734)	-0.0422 (<0.0001)
Fix.contract	-0.0879 (0.0396)	-0.103 (0.7515)	-0.1025 (0.0184)	-0.2649 (0.1292)	0.4209 (0.8129)	-0.2753 (0.123)
Perm.contract	0.1042 (0.0034)	1.9 (<0.0001)	0.0551 (0.1686)	0.3771 (0.0063)	2.6163 (0.0514)	0.3077 (0.0363)
Instrument 1	–	0.5425 (<0.0001)	–	–	0.6752 (0.0001)	–
Instrument 2	–	2.6031 (<0.0001)	–	–	-4.5426 (0.0001)	–
Hausman exogeneity test	–	7.800 (0.0053)		–	17.533 (<0.0001)	
Sargan–Hansen test	–	2.469 (0.1161)		–	0.692 (0.4050)	
R^2	0.4101	0.6053	0.3976	0.6348	0.6897	0.6189
F/Wald statistic	100.4	199.3	80.39	14.87	16.89	12.65

Source: Authors' estimates.

Following Bhatti et al. (2013), we attempt to choose the most appropriate instrumental variable of the two we have proposed through a correlation analysis. Tables A1 to A8 (in the Appendix) provide partial correlation matrices (with p-values in parentheses) of the response variable, suspected endogenous variable (schooling) and both instruments. We observe that, in most cases, instrument 2 has a lower correlation with endogenous schooling and a higher correlation with the response variable,

which negates its value as a good instrument. On the other hand, instrument 1 has a reasonably strong correlation with the endogenous variable and a smaller correlation with the response variable, which implies it is a more relevant and appropriate instrumental variable. Keeping these correlation measures in view and its conceptual superiority, we give preference to instrument 1 as being more appropriate to the IV-2SLS estimation. Another advantage is that it is generated from the data itself.

4. Discussion

Since the Hausman (1978) test statistic indicates that schooling is endogenous and we consider the IV-2SLS estimation technique more suitable than OLS, this section discusses the IV-2SLS results in more detail. These results show that returns to schooling are, in most cases, 50 percent higher than the OLS results would indicate, which is in line with the results obtained by Bhatti et al. (2013), Butcher and Case (1994) and Card (1993). Returns to labor market experience are slightly higher in the IV-2SLS estimation, with each additional year of labor market experience causing monthly wages to rise at a decreasing rate.

As with Barnet-Verzat and Wolff (2008) and Araï et al. (1996), we find significant gender wage differentials in the returns to education. This is also in line with other Pakistan-based studies such as Yasin et al. (2010), Hyder (2007) and Khan and Toor (2003). The coefficient of work location (urban or rural) indicates that urban males earn more than their rural counterparts, except in Balochistan. The reverse holds true for female workers. A significant wage gap associated with location emerges for Punjab alone. This finding is similar in direction but smaller in magnitude to that of Farooq and Sulaiman (2009).

Our results show that, when corrected for the endogeneity of schooling, the wage premium of holding a professional degree falls substantially for both genders in all provinces. The IV-2SLS estimation indicates that people with a professional degree earn more than those without, reflecting the results obtained by Hyder (2007) and Khan and Toor (2003). However, this difference is not statistically significant for females in KP and Balochistan. Generally, there is a significant wage loss associated with working in the public sector compared to the private sector for both male and female workers. This finding contradicts Hyder (2007), who reports higher earnings for public sector workers in Pakistan.

We also find that people with permanent employment earn more than those on a fixed-term or temporary contract, with male workers in KP being the exception. Our findings concerning provincial effects are in line with many other studies on the Pakistani labor market, including Farooq and Sulaiman (2009) and Khan and Toor (2003). A seeming discrepancy is that, generally, both specifications yield an R^2 term of near 40 percent, which looks small but is common in cross-sectional studies (see Gujarati, 2007).

5. Conclusion

This study has used two new instrumental variables to correct for the possibility of endogeneity bias in schooling. The results reveal the significance of this endogeneity bias and the relevance of both instrumental variables. We find that instrument 1 – the average number of years of education in the enumeration block where the individual's household is located – is superior on statistical as well as conceptual grounds.

The results show that each additional year of schooling increases wages by 7.5 percent (for males), 8.5 percent (for females), 11.3 percent (for males), 9.8 percent (for females), 8.4 percent (for males), 7.6 percent (for females), 7.0 percent (for males) and 7.5 percent (for females) in Punjab, Sindh, KP and Balochistan, respectively. Urban wage markets offer some benefits, but not as much in terms of magnitude and significance. There is a significant wage gain for those with a professional degree. Finally, permanent employment is better remunerated than fixed-contract work.

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Appendix

Table A1: Correlation matrix, Punjab (male)

Variable	Lnwage	Education	Instrument 1	Instrument 2
Lnwage	1	0.3979	0.1408	-0.2699
		(<0.0001)	(<0.0001)	(<0.0001)
Education	0.3979	1	0.515	0.4308
	(<0.0001)		(<0.0001)	(<0.0001)
Instrument 1	0.1408	0.515	1	-0.0542
	(<0.0001)	(<0.0001)		(<0.0001)
Instrument 2	-0.2699	0.4308	-0.0542	1
	(<0.0001)	(<0.0001)	(<0.0001)	

Source: Authors' estimates.

Table A2: Correlation matrix, Punjab (female)

Variable	Lnwage	Education	Instrument 1	Instrument 2
Lnwage	1	0.393	0.1504	-0.3321
		(<0.0001)	(0.001189)	(<0.0001)
Education	0.393	1	0.5398	0.449
	(<0.0001)		(<0.0001)	(<0.0001)
Instrument 1	0.1504	0.5398	1	-0.0142
	(0.001189)	(<0.0001)		(0.760481)
Instrument 2	-0.3321	0.449	-0.0142	1
	(<0.0001)	(<0.0001)	(0.760481)	

Source: Authors' estimates.

Table A3: Correlation matrix, Sindh (male)

Variable	Lnwage	Education	Instrument 1	Instrument 2
Lnwage	1	0.4135	0.3036	-0.3212
		(<0.0001)	(<0.0001)	(<0.0001)
Education	0.4135	1	0.4373	0.4758
	(<0.0001)		(<0.0001)	(<0.0001)
Instrument 1	0.3036	0.4373	1	-0.0253
	(<0.0001)	(<0.0001)		(0.141475)
Instrument 2	-0.3212	0.4758	-0.0253	1
	(<0.0001)	(<0.0001)	(0.141475)	

Source: Authors' estimates.

Table A4: Correlation matrix, Sindh (female)

Variable	Lnwage	Education	Instrument 1	Instrument 2
Lnwage	1	0.347	0.2396	-0.2144
		(<0.0001)	(0.0001)	(0.0005)
Education	0.347	1	0.5197	0.3414
	(<0.0001)		(<0.0001)	(<0.0001)
Instrument 1	0.2396	0.5197	1	-0.1253
	(0.0001)	(<0.0001)		(0.0448)
Instrument 2	-0.2144	0.3414	-0.1253	1
	(0.0005)	(<0.0001)	(0.0448)	

Source: Authors' estimates.

Table A5: Correlation matrix, KP (male)

Variable	Lnwage	Education	Instrument 1	Instrument 2
Lnwage	1	0.4739	0.104	-0.3767
		(<0.0001)	(0.0001)	(<0.0001)
Education	0.4739	1	0.4393	0.5378
	(<0.0001)		(<0.0001)	(<0.0001)
Instrument 1	0.104	0.4393	1	-0.1136
	(<0.0001)	(<0.0001)		(<0.0001)
Instrument 2	-0.3767	0.5378	-0.1136	1
	(0.0001)	(<0.0001)	(<0.0001)	

Source: Authors' estimates.

Table A6: Correlation matrix, KP (female)

Variable	Lnwage	Education	Instrument 1	Instrument 2
Lnwage	1	0.3524	0.1289	-0.4564
		(<0.0001)	(0.1089)	(<0.0001)
Education	0.3524	1	0.3699	0.5059
	(<0.0001)		(<0.0001)	(<0.0001)
Instrument 1	0.1289	0.3699	1	-0.1005
	(0.1089)	(<0.0001)		(0.2125)
Instrument 2	-0.4564	0.5059	-0.1005	1
	(<0.0001)	(<0.0001)	(0.2125)	

Source: Authors' estimates.

Table A7: Correlation matrix, Balochistan (male)

Variable	Lnwage	Education	Instrument 1	Instrument 2
Lnwage	1	0.4913	0.0723	-0.3426
		(<0.0001)	(0.0088)	(<0.0001)
Education	0.4913	1	0.4365	0.5632
	(<0.0001)		(<0.0001)	(<0.0001)
Instrument 1	0.0723	0.4365	1	-0.0856
	(0.0088)	(<0.0001)		(0.0019)
Instrument 2	-0.3426	0.5632	-0.0856	1
	(<0.0001)	(<0.0001)	(0.0019)	

Source: Authors' estimates.

Table A8: Correlation matrix, Balochistan (female)

Variable	Lnwage	Education	Instrument 1	Instrument 2
Lnwage	1	0.5315	0.2008	-0.394
		(<0.0001)	(0.0654)	(0.0002)
Education	0.5315	1	0.4127	0.5087
	(<0.0001)		(<0.0001)	(<0.0001)
Instrument 1	0.2008	0.4127	1	-0.1347
	(0.0654)	(<0.0001)		(0.2192)
Instrument 2	-0.394	0.5087	-0.1347	1
	(0.0002)	(<0.0001)	(0.2192)	

Source: Authors' estimates.